

initial vegetation condition are carefully compared to investigate the difference of energy and moisture flux between the land and atmosphere. In this case, newly-generated vegetation fraction data from Goddard Space Flight Center (GSFC) Advance Very High Resolution Radiometer (AVHRR) NDVI from 1982 to 2000 is incorporated into the land surface parameterization of the MM5-OSU model. Preliminary control simulations, using fixed vegetation fraction through June-September, are compared with other simulations, using time-varying vegetation fraction. In this study time-varying vegetation fraction only change evapotranspiration rate. Other vegetation-related parameters, e.g., albedo, moisture contents, emissivity, and thermal inertia, are fixed through simulations. Therefore the resulting comparison between fixed and time-varying vegetation fraction can portray the influence of evapotranspiration on the NAMS.

## A51E MC: Hall D Friday 0830h

### The Upper Atmosphere Research Satellite: Ten Years in Orbit II

**Presiding: C H Jackman, NASA**  
Goddard Space Flight Center; **A R**  
Douglass, NASA Goddard Space  
Flight Center

## A51E-0084 0830h POSTER

### ACRIM II and III Data Available from the Atmospheric Sciences Data Center

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The Active Cavity Radiometer Irradiance Monitor (ACRIM) II flew on board the Upper Atmosphere Research Satellite (UARS). ACRIM III was launched in 1999 on ACRIMSAT. Some of the goals of ACRIM are to monitor variability of total solar irradiance (TSI) including solar cycles and sunspots and analyze relationships between TSI and climate change. ACRIM II and III data are available from the NASA Langley Atmospheric Sciences Data Center (ASDC). ACRIM II data are available for October 1991 through August 1997. ACRIM III data are available from April 2000 through the present. These data may be obtained from the NASA Langley ASDC at <http://eosweb.larc.nasa.gov>.  
URL: <http://eosweb.larc.nasa.gov>

## A51E-0085 0830h POSTER

### SORCE - Continuing Measurements of Solar Irradiance

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The NASA/EOS Solar Radiation and Climate Experiment (SORCE) will measure the total and the spectral irradiance from the Sun, continuing the solar data record from the Upper Atmosphere Research Satellite (UARS). Four SORCE instruments provide irradiance measurements at wavelengths from 1 nm to longer than 2000 nm. The Total Irradiance Monitor (TIM) measures total solar irradiance (TSI), similar to the UARS/ACRIM instrument. The TIM will achieve a relative standard uncertainty ( $1\sigma$  precision) of 100 parts per million (ppm), continuing the 23-year record of TSI measurements. SORCE's two SOLAR STellar Irradiance Comparison Experiment (SOLSTICE) instruments are nearly identical to the SOLSTICE flown on UARS. These grating spectrometers monitor the more highly-variable solar ultraviolet irradiance over the wavelength range 120 to 300 nm with a 2 to 5% absolute uncertainty and a capability of making relative solar variability measurements with an accuracy of 0.5% by using stable, blue stars for in-flight calibration. The Spectral Irradiance Monitor (SIM) is a new prism spectrometer providing the first continuous solar spectral irradiance measurements from 200 to 2000 nm with 300 ppm uncertainty. The XUV Photometer System (XPS) covers 1 to 35 nm using 9 spectral bandpass filters to measure

the large solar irradiance variations in the extreme ultraviolet with a  $\sim 20\%$  accuracy.

Launching in July of 2002 with a mission life goal of 5 years, SORCE will extend the UARS solar irradiance database in time as well as spectral region. SORCE data will be available via NASA/GSFC's Distributed Active Archive Center (DAAC) as well as from LASP's web site (<http://lasp.colorado.edu/sorce>).

URL: <http://lasp.colorado.edu/sorce/>

## A51E-0086 0830h POSTER

### Multi-Decade Long Total Solar Irradiance Measurements

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Total solar irradiance has been measured from space for more than two decades by various instruments. These irradiance observations demonstrate that total irradiance changes on time scales from minutes to decades. While studying short-term irradiance variations are important for solar physics, establishing the amplitude of irradiance variations within a particular solar cycle and from one cycle to another is important also for climate studies. The composite total irradiance, compiled from various time series, indicates that the amplitude of total irradiance is about the same during the minima and maxima of solar cycles 21, 22, and 23 within the measuring uncertainties. Since the ACRIM time series provides the longest data set in the composite total irradiance, the ACRIM data are compared to the measurements of the Nimbus-7/ERB, ERBS and SOHO/VIRGO total irradiance using various processings of the UARS/ACRIM II measurements.

## A51E-0087 0830h POSTER

### Solar UV Spectral Irradiance Variation During Solar Cycle 23

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The Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) aboard the UARS has measured the solar spectral irradiance at UV wavelengths in the 115-410 nm range since October 1991. This period extends from a secondary maximum of solar activity before the decline of solar cycle 22, through the intervening solar minimum, and through the solar cycle 23 maximum. Accordingly, SUSIM has observed nearly the entire UV variation of both solar cycles. SUSIM uses deuterium lamps and redundant optical channels to determine changes in its responsivity since its final ground calibration more than ten years before the latest measurements. The new results for the wavelength-dependent variation of the solar UV spectral irradiance during solar cycle 23 will be presented. Trends in solar irradiance and in possible error sources are identified and analyzed. Emphasis will be placed on comparisons with variations observed during solar cycle 22 and on their relationship with solar indices (such as the MgII core-to-wing ratio). The rationale for continuing redundant and overlapping measurements of the solar UV irradiance will be provided.  
URL: <http://wwwsolar.nrl.navy.mil/susim-uars.html>

## A51E-0088 0830h POSTER

### Global Distribution of Stratospheric NO<sub>2</sub> Retrieved from UARS/CLAES Limb Radiance Measurements

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The Cryogenic Limb Array Etalon Spectrometer (CLAES) aboard the Upper Atmosphere Research Satellite (UARS) has made extensive measurements of thermal infrared emission from Earth's Limb during the period of Sept., 1991 to May 1993. We describe the development and application of a maximum likelihood retrieval algorithm to the UARS/CLAES Blocker-3 6.23 micron radiance measurements. These data provide the first near-global diurnal view of stratospheric NO<sub>2</sub> since the 1979 LIMS instrument. We also discuss data quality through an analysis of estimated uncertainties, and biases resulting from our retrieval algorithm, comparison with correlative NO<sub>2</sub> measurements and an examination of known limitations.

## A51E-0089 0830h POSTER

### A Comparison of HALOE/UARS Derived Methane Profiles With Balloon Measurements

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Measurements of various minor constituents from a tropical location in India (Hyderabad; 17.5N, 78.6E) has been started 1987 using the balloon-borne cryosampler technique and gas chromatography based laboratory analysis. In the period of 1987 to 1998, four balloon flights have been conducted on (1) March 27, 1987, (2) April 9, 1990, (3) April 16, 1994, and (4) April 18, 1998. The vertical distribution of CH<sub>4</sub> are constructed in the altitude range of about 8 to 37 km by GC-FID analysis and calibrated against the Linde/NIST calibration gases. The 1987, 1994 and 1998 profiles are overall in agreement (except a small kink) with each other as well as with the MPIC 2D model simulations, whereas that for 1990 deviates significantly in 25-32 km altitude range.

We have estimated the HALOE CH<sub>4</sub> vertical profiles by averaging all the available data between 16°N-19° latitude in March-April of every year. To obtain values at particular altitude the HALOE profiles (Level 2 data, SPF formatted) were first interpolated. The basic characteristics of the CH<sub>4</sub> profiles from balloon-borne and HALOE measurements are fairly in agreement on overlapping time period.

It is also apparent from the HALOE data that the interannual variations of CH<sub>4</sub> at most stratospheric altitude has the strong stratospheric QBO signal. Satellite data show that in the easterly phase of QBO the enhanced mixing rate near the sub-tropical 'surf' zone lower the CH<sub>4</sub> concentration around 30 km, where the QBO intensity peaks. This was the situation in March-April 1990 and 1997. Thus the 1990 balloon profile closely matches with the 1997 HALOE CH<sub>4</sub>. However, it should be pointed out that the satellite based vertical profiles are rather smooth compared to the in-situ observations. This smoothing could be caused by the algorithm used in the vertical profile estimation from the radiation spectra.

Detailed results and features will be discussed during the presentation.

## A51E-0090 0830h POSTER

### Chemical Ozone Loss and Chlorine Activation Deduced From HALOE and OMS Measurements in Arctic Winter 1999-2000

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We employ observations from HALOE and from balloon-borne instruments (on OMS-remote, OMS in-situ, and Triple) to investigate ozone loss in the stratosphere in the vortex in Arctic winter 1999-2000. Using HF and CH<sub>4</sub> as a long-lived tracer, we identify chemical ozone destruction and chlorine activation in the polar vortex. Reference relations, relevant for chemically undisturbed "early vortex" conditions are derived from the OMS-remote and in-situ balloon measurements on 19 November and 3 December 1999. Deviations from this "early vortex" reference are caused by chemical ozone loss and heterogeneous chlorine activation. The observations indicate severe chemical ozone loss, with a maximum loss of over 60% locally in the lower stratosphere (465-415 K) by mid-March 2000. The average loss in column ozone between 380-550 K, (deep) inside the vortex, in mid-March amounts to about  $85 \pm 10$  DU.

The findings for winter 1999-2000 are put into perspective of Arctic ozone loss deduced from HALOE measurements in earlier cold winters (e.g., 1992-1993, 1994-1995, and 1996-1997). These winters have been reanalysed using the most recent HALOE data version. Further, additional observations were taken into account to investigate the validity of the reference relation for chemically unperturbed conditions in the early vortex.

#### A51E-0091 0830h POSTER

##### Some Characteristics of the Mesosphere and Lower Thermosphere (MLT) as Observed by the High Resolution Doppler Imager (HRDI) on UARS

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The HRDI instrument measured the winds, temperature, and molecular oxygen A band volume emission rate from November, 1991 until September, 2001. The altitudes examined were typically 65-115 km. The precession rate of UARS allowed complete local time coverage at mid and low latitudes to be sampled in about a month. This paper examines features found in nearly 10 years of MLT data collected by HRDI. This length of time has covered about 20 semi-annual cycles, 10 annual cycles, 4 QBO cycles, and almost an entire solar cycle. The response of the wind and temperature fields to these phenomena are examined

#### A51E-0092 0830h POSTER

##### Data Comparison: Satellite and Falling Sphere Temperatures

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Small meteorological rocketsondes providing temperature data have been used for comparison with, and validation of measurements from satellite-borne instruments. A significant number of rocket-borne falling spheres were launched in conjunction with the Upper Atmosphere Research Satellite (UARS) for validation of the Halogen Occultation Experiment (HALOE), High Resolution Doppler Interferometer (HRDI), and the Microwave Limb Sounder (MLS) instruments. Upper stratosphere and mesosphere temperatures measured with these instruments on UARS are compared with inflatable spheres launched from Wallops Island (1992-1998), Brazil (1994), Hawaii (1992), Norway (1992), and Sweden (1993 and 1996). Time and space differences varied between the satellite measurement and the rocketsonde launch, for example HALOE overpasses occurred within 5 days and in some cases there were spatial differences of up to 30 degrees longitude. Validation measurements of the HRDI instrument occurred at Wallops Island when it passed within 20 minutes and 330 kilometers of the launch site. Because of discontinuity in the falling sphere drag coefficients when fall speed neared MACH 1 falling sphere temperatures near 70 kilometers altitude are biased toward lower temperatures. Availability of improved software and a new atmospheric model have helped to reduce this bias. The

validated remote instrument measurements permit a new perspective of atmospheric structure to be formed, not always possible with the limited number of falling sphere measurements. Features of the remote measurement temperature profiles and their possible use to extend the climatological data base at the rocketsonde sites will be discussed.

#### A51E-0093 0830h POSTER

##### Longitudinal Variations of Mesospheric Temperature at Middle and High Latitudes - the WINDII Perspective

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Longitudinal variations of mesospheric temperatures observed by the WIND Imaging Interferometer (WINDII) on the Upper Atmosphere Research Satellite will be presented and discussed. The study will examine global day-to-day and year-to-year variability in the height range 65-95 km. Planetary scale perturbations will be analysed employing LMS spectral analysis.

#### A51F MC: Hall D Friday 0830h

##### Tropospheric Chemistry and Constituents II

*Presiding: P Shepson, Purdue University,*

#### A51F-0094 0830h POSTER

##### Effect of a Frontal System on Non-Methane Hydrocarbon Distribution over Central Europe

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The distribution of C2-C7 non-methane hydrocarbons (NMHC) has been determined during periods of convective and frontal activity over central Europe. High frequency whole air sampling was carried out on board the UK Meteorological Office C-130 Hercules aircraft during the EXPORT campaign, August 2000 (European eXport of Precursors and Ozone by long-Range Transport). The distribution of NMHC during and after the passage of a WCB (Warm Conveyor Belt) associated with a cold front was investigated. Advection was shown to have occurred over several days but embedded convection within the WCB caused rapid uplift of reactive carbon from the boundary layer to the mid-troposphere. Post-WCB, elevated levels of NMHC in the free troposphere due to convective mixing were observed. High mixing ratios of NMHC were found at altitudes of up to 5 km (propene,  $t = 5.28$  hours, 13.8pptV).

The observations indicate that uplift of reactive NMHC during frontal passage may significantly perturb partitioning and abundance of inorganic and organic peroxy radicals and lifetime of hydroxyl radical (OH). The net production rate of ozone (N(O<sub>3</sub>)) within the WCB was calculated using the photostationary state expression (PSS), showing net ozone production in the free troposphere.

#### A51F-0095 0830h POSTER

##### Mono-aromatic complexity in urban air and gasoline assessed using comprehensive GC and fast GC-TOF/MS.

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Two state-of-the-art analytical techniques have been used to assess mono-aromatic complexity in gasoline, gasoline vapors and polluted urban air. A comparison of comprehensive gas chromatography (GCxGC) and fast gas chromatography - time-of-flight mass spectrometry (GC-TOF-MS) has been made, with emphasis on the ability of each technique to appreciate at high isomeric complexity. The high spectral acquisition rates from TOF-MS gave improved peak deconvolution of overlapping analytes when compared to standard quadrupole configurations, with 89 mono-aromatic isomers isolated in gasoline in a 200 s GC separation. Highest resolution was obtained using GCxGC, isolating 140 mono-aromatics, using combined column retention behavior for analyte identification. Analysis of urban air using GCxGC indicated the presence of 136 mono-aromatic species with up to 7 carbon substituents on the ring. Comparison of 3D GCxGC chromatograms for air and gasoline vapors demonstrated visually the impact of evaporative emission sources in urban environments. The potential contribution of larger mono-aromatic compounds as precursors to both photochemical ozone and secondary organic aerosol is discussed along with the implications on modeling OH chemistry in polluted air.

#### A51F-0096 0830h POSTER

##### Modeling Biogenic Emission Sources of Acetone and Other Oxygenated Organic Carbon Compounds

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Acetone is of considerable interest in atmospheric chemistry as a source of HO<sub>x</sub> radicals and peroxyacetyl nitrate (PAN) to the upper troposphere. The potential biogenic sources of acetone include terrestrial plant canopies, oxidation of dead plant matter, harvest of cultivated plants, biomass burning, and the oceans. These sources are very poorly constrained at present. Based on laboratory, field, and satellite observations to date, we present a first global modeling approach for estimating daily emissions of acetone from the terrestrial biosphere. Our modeling approach is driven by observed surface climate and estimates of vegetation leaf area index (LAI) generated at 0.5 degree spatial resolution from the NOAA satellite Advanced Very High Resolution Radiometer (AVHRR). Seasonal changes in LAI are estimated using modified MODIS radiative transfer algorithms to identify the probable dates and locations of crop harvest in cultivated areas and litter-fall of newly dead plant matter in non-cultivated areas. Temperature-dependent emission factors are applied to derive global budgets of acetone fluxes from terrestrial plant canopies, oxidation of dead plant matter, and harvest of cultivated plants.

URL: <http://geo.arc.nasa.gov/sge/casa>